

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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**SWITCHING  
 N-CHANNEL POWER MOS FET**

**DESCRIPTION**

The 2SK3305 is N-channel DMOS FET device that features a low gate charge and excellent switching characteristics, and designed for high voltage applications such as switching power supply, AC adapter.

**FEATURES**

- Low gate charge  
 $Q_G = 13 \text{ nC TYP. (} V_{DD} = 400 \text{ V, } V_{GS} = 10 \text{ V, } I_D = 5.0 \text{ A)}$
- Gate voltage rating:  $\pm 30 \text{ V}$
- Low on-state resistance  
 $R_{DS(on)} = 1.5 \Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 2.5 \text{ A)}$
- Avalanche capability ratings

**ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )**

Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	500	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS(AC)}$	$\pm 30$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 5$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 20$	A
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_T$	75	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_T$	1.5	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Single Avalanche Current <sup>Note2</sup>	$I_{AS}$	5.0	A
Single Avalanche Energy <sup>Note2</sup>	$E_{AS}$	125	mJ

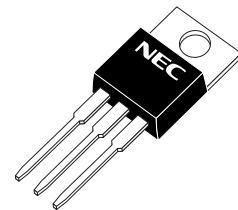
**Notes 1.**  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$

**2.** Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = 150 \text{ V}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \rightarrow 0 \text{ V}$

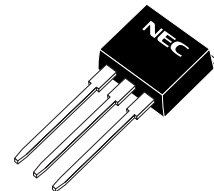
**ORDERING INFORMATION**

PART NUMBER	PACKAGE
2SK3305	TO-220AB
2SK3305-S	TO-262
2SK3305-ZJ	TO-263

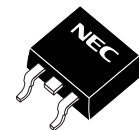
(TO-220AB)



(TO-262)



(TO-263)



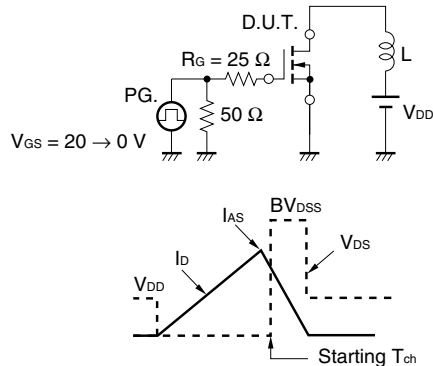
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**ELECTRICAL CHARACTERISTICS (TA = 25°C)**

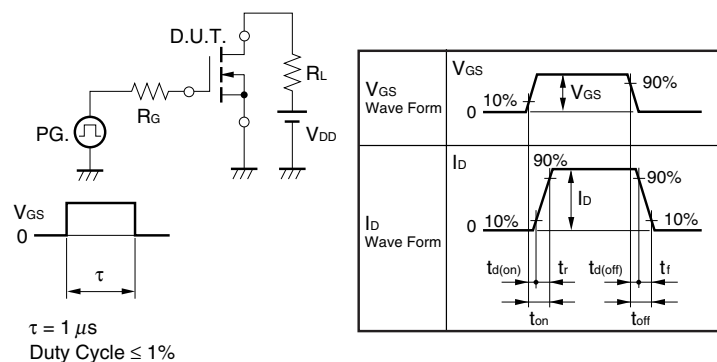
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$			100	$\mu\text{A}$
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$			$\pm 100$	nA
Gate Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	2.5		3.5	V
Forward Transfer Admittance <b>Note</b>	$ y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 2.5\text{ A}$	1.0	3.0		S
★ Drain to Source On-state Resistance <b>Note</b>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 2.5\text{ A}$		1.1	1.5	$\Omega$
Input Capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}$		700		pF
Output Capacitance	$C_{oss}$	$V_{GS} = 0\text{ V}$		115		pF
Reverse Transfer Capacitance	$C_{rss}$	$f = 1\text{ MHz}$		6		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 150\text{ V}, I_D = 2.5\text{ A}$		16		ns
Rise Time	$t_r$	$V_{GS} = 10\text{ V}$		3		ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 10\ \Omega$		33		ns
Fall Time	$t_f$	$R_L = 60\ \Omega$		5.5		ns
Total Gate Charge	$Q_G$	$V_{DD} = 400\text{ V}$		13		nC
Gate to Source Charge	$Q_{GS}$	$V_{GS} = 10\text{ V}$		4		nC
Gate to Drain Charge	$Q_{GD}$	$I_D = 5.0\text{ A}$		4.5		nC
Body Diode Forward Voltage <b>Note</b>	$V_{F(S-D)}$	$I_F = 5.0\text{ A}, V_{GS} = 0\text{ V}$		0.9		V
Reverse Recovery Time	$t_{rr}$	$I_F = 5.0\text{ A}, V_{GS} = 0\text{ V}$		0.6		$\mu\text{s}$
★ Reverse Recovery Charge	$Q_{rr}$	$di/dt = 100\text{ A}/\mu\text{s}$		3.3		$\mu\text{C}$

**Note** Pulsed

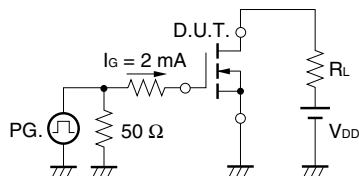
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



**TEST CIRCUIT 2 SWITCHING TIME**



**TEST CIRCUIT 3 GATE CHARGE**



TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

Figure1. DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA

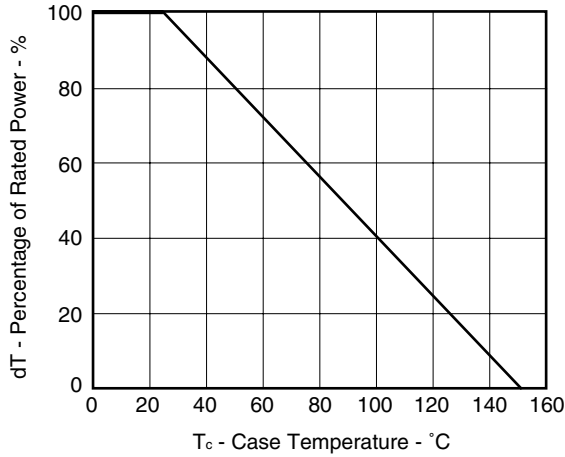


Figure2. TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

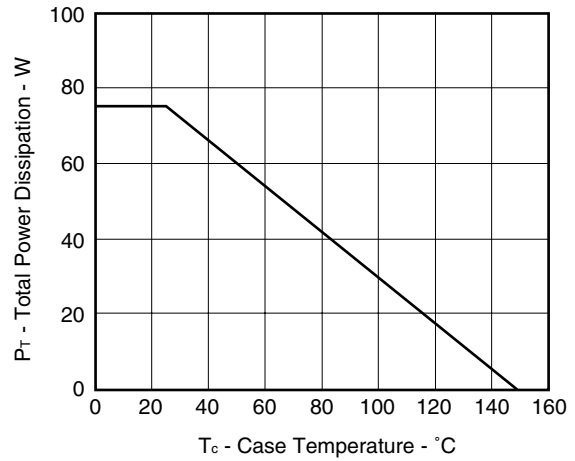


Figure3. FORWARD BIAS SAFE OPERATING AREA

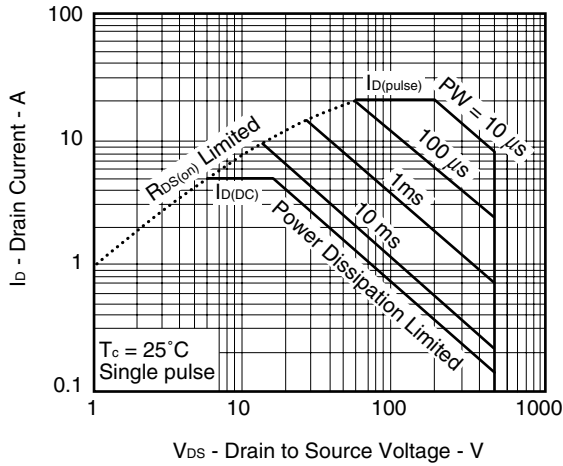


Figure4. DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

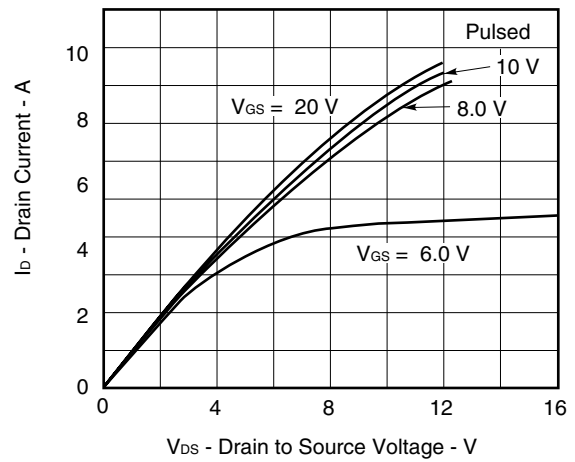


Figure5. DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE

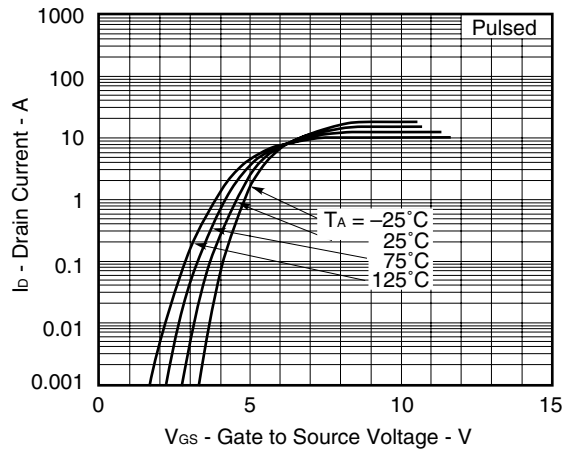


Figure6. TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

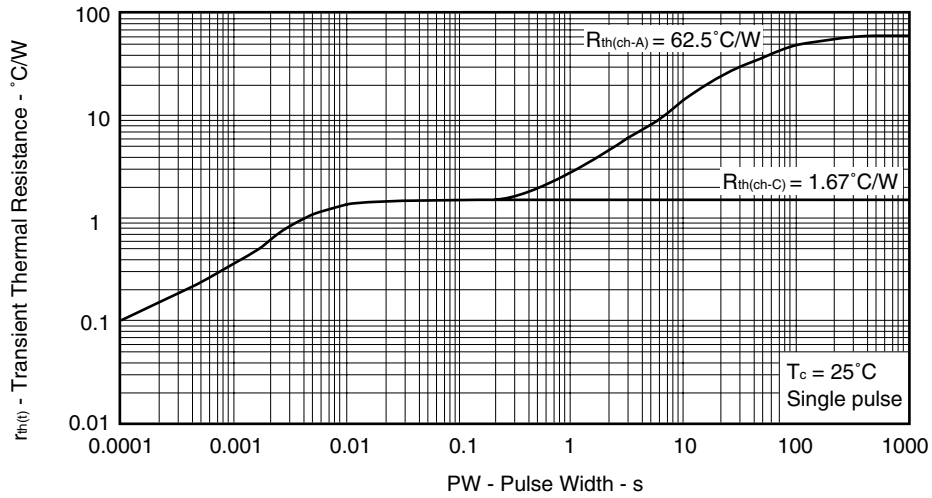


Figure7. FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

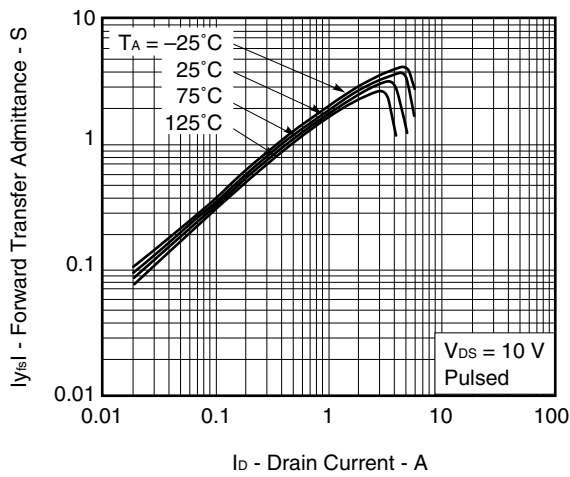


Figure8. DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

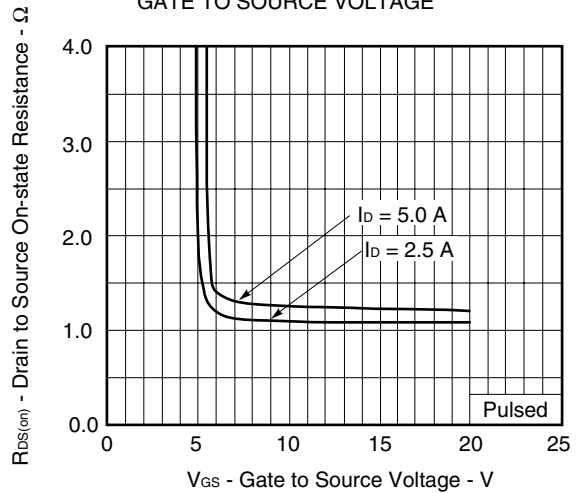


Figure9. DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

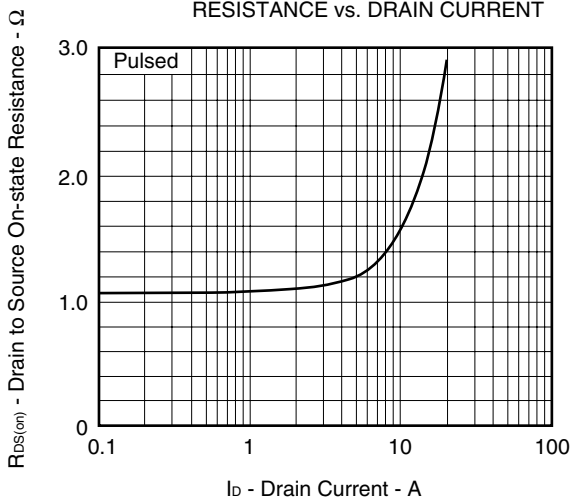


Figure10. GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE

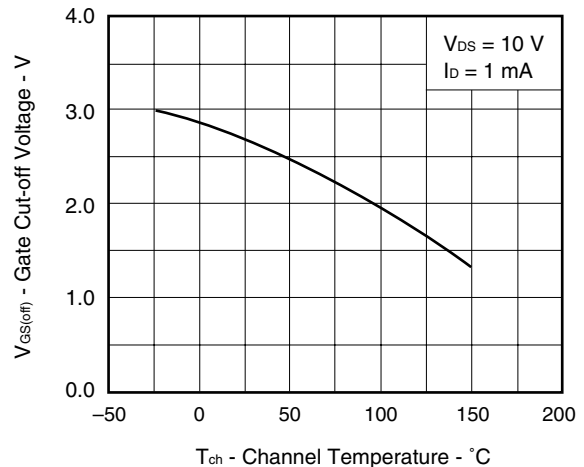


Figure11. DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE

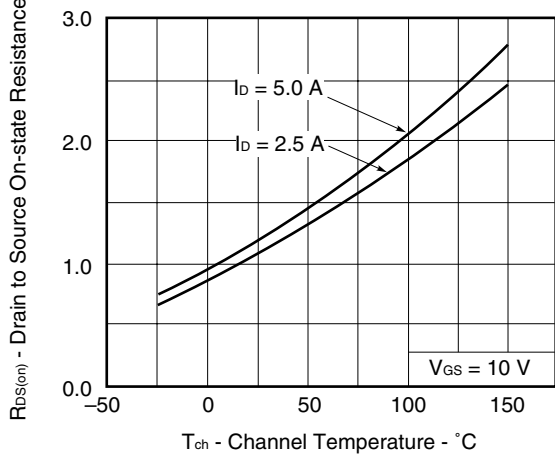


Figure12. SOURCE TO DRAIN DIODE FORWARD VOLTAGE

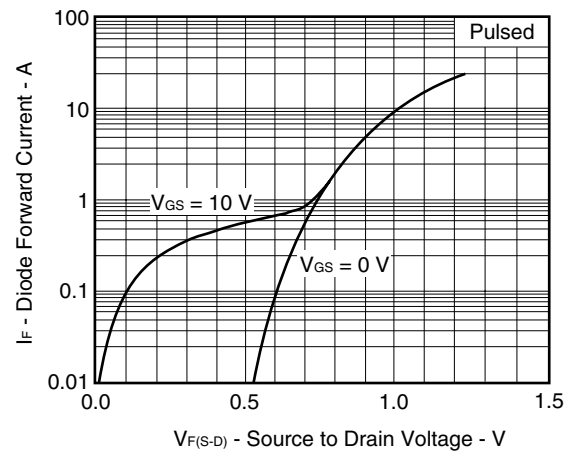


Figure13. CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE

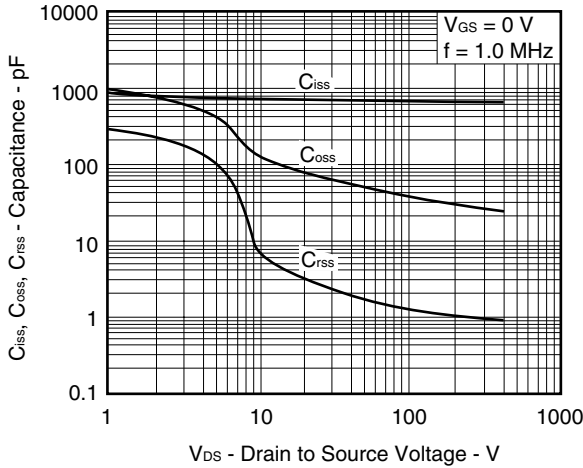


Figure14. SWITCHING CHARACTERISTICS

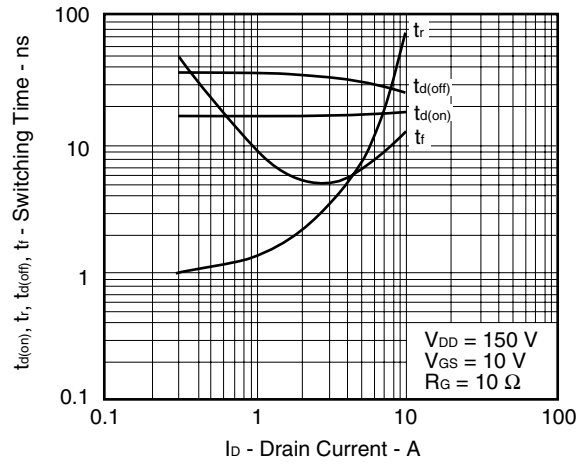


Figure15. REVERSE RECOVERY TIME vs. DIODE CURRENT

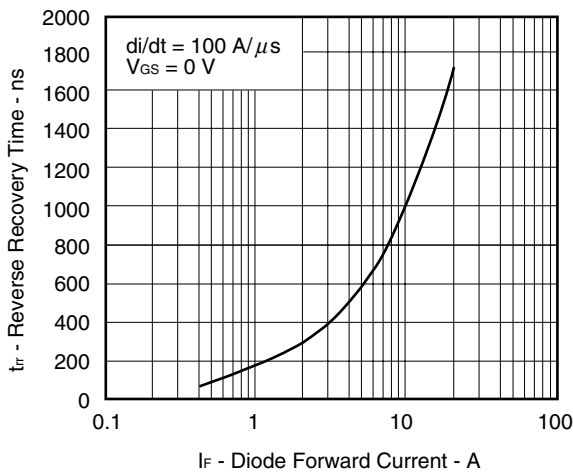


Figure16. DYNAMIC INPUT/OUTPUT CHARACTERISTICS

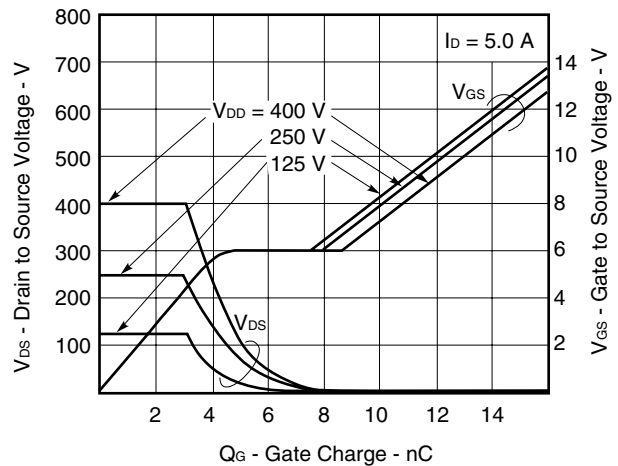


Figure17. SINGLE AVALANCHE ENERGY vs STARTING CHANNEL TEMPERATURE

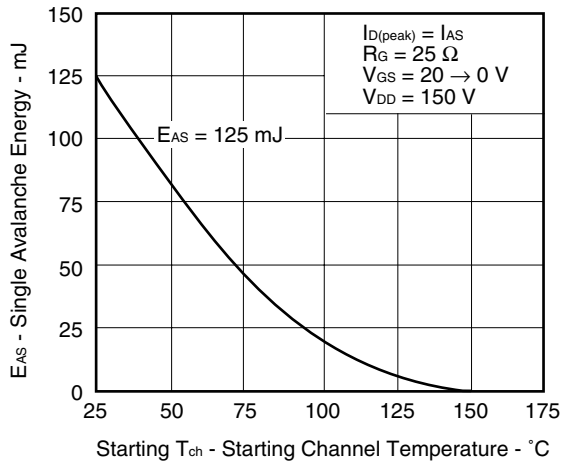
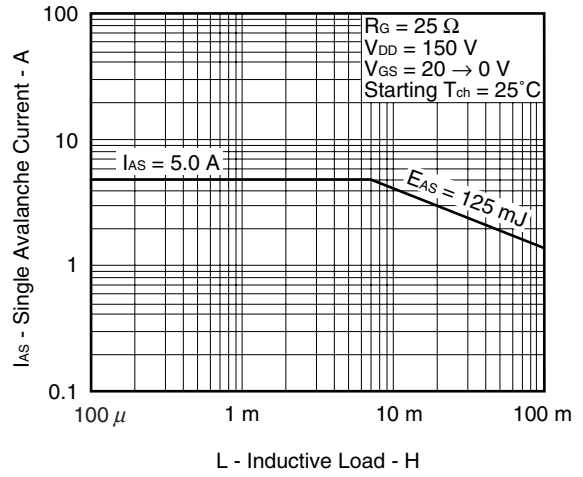


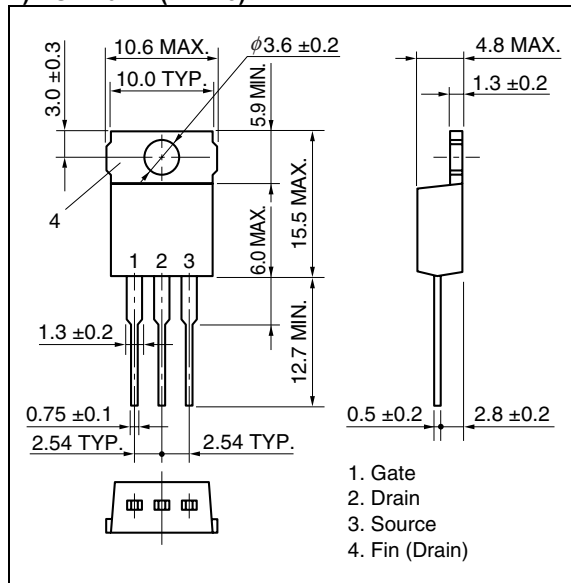
Figure18. SINGLE AVALANCHE CURRENT vs INDUCTIVE LOAD



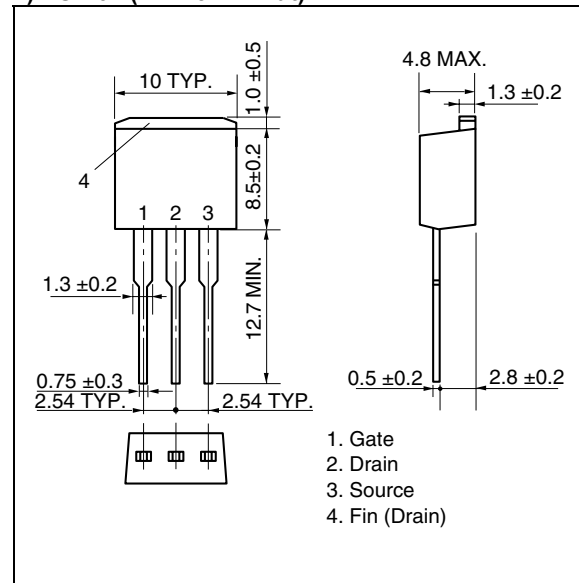


★ PACKAGE DRAWINGS (Unit: mm)

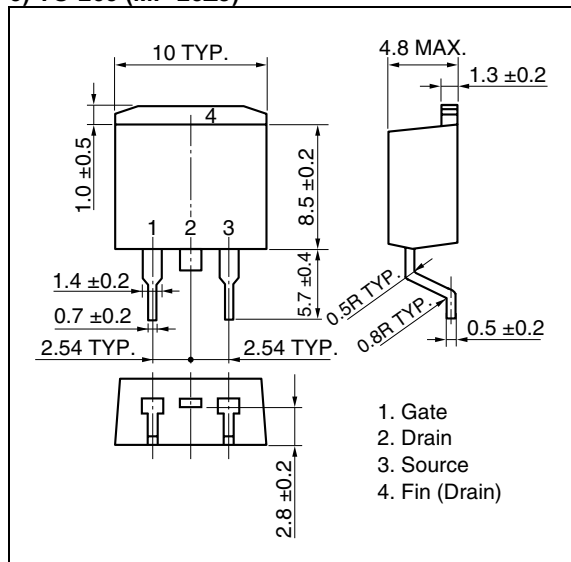
1) TO-220AB (MP-25)



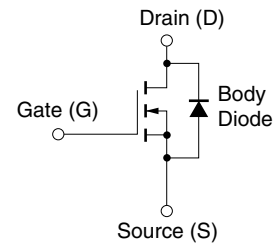
2) TO-262 (MP-25 Fin Cut)



3) TO-263 (MP-25ZJ)



EQUIVALENT CIRCUIT



**Remark** Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

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